S210-P008 **Room: Poster Session Hall** **Time: May 16**

Rayleigh wave sacattering and resonant standing waves

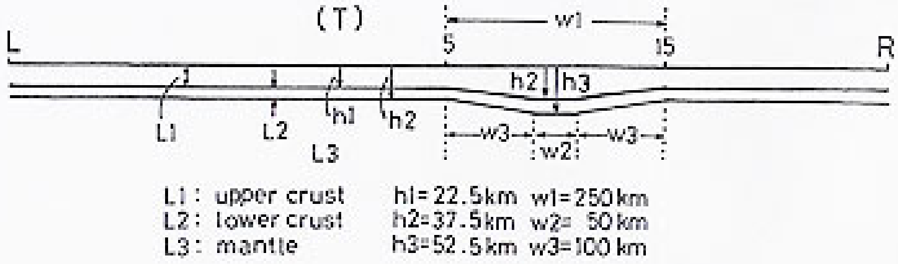
Mitsuru Yoshida[1]

[1] nothing

Rayleigh wave scattering caused by the mountain root structures (M.R.S) of the Tien Shan (Fig. 1), China, has been investigated. Physical parameters used are shown in Table 1 and the computation method is described in Yoshida (2001). Shear wave velocity of Vs=4.9 km/s in the upper mantle, corresponding to the western part of the Tien Shan, is adopted in the computation. The fundamental mode Rayleigh waves are initialized in the stratified medium and the wave propagation through the M.R.S is calculated based on the finite difference method. Scattered waves (Sc) are extracted from the definition (Aki and Richard, 1980) : Sc(x,z,t) =En(x,z,t) - Pr(x,z,t) (1) and their spectra are analyzed. In Eq. (1) En and Pr correspond to entire seismograms and incident waves, respectively. The amplitude spectra (Fig. 2) of Pr and Sc at sites 5, 10, and 15, calculated for Model T, indicate a peak at a period of 23 sec (wavelength (WL) of 90 km), where site 10 is located at the midpoint of the M.R.S. According to Yoshida (2003) there are five or six wavefronts of scattered waves consisting of a pair of positive and negative phases in the wavefield of a distance of 500 km between the left edge (L) and site 5. Hence, the wavelengths of Sc are estimated to be 90-100 km and are close to that of Pr. Phase velocity of Rayleigh waves at 23 sec is about 4.0 km/s (Fig. 3). Thus, the velocity of 4.0 km/s is inferred to be the propagation velocity of scattered waves.

When Rayleigh waves impinge on the mountain the resonant standing P and S waves of leaky mode (Snodgrass et al., 1962) occur (Momoi, 1987). The waves have a component expressed in terms of the trigonometric function. The resonant standing waves dominate when Eq. (2) is satisfied: kH=(2n+1)p / 2 (n: integer; p=3.1416) (2) where k and H are the wave number and the crustal thickness. This equation is expressed as WL=4H / (2n+1) (n: integer) (3) Substituting the upper crustal thickness of H=22.5 km for Model T into Eq. (3), we have WL=90(n=0), (n=1)30 km. The value of WL=90 km will possibly corresponds to that (WL=90-100km) of scattered waves estimated before. Substituting WL=90km and Vs=3.9 km/s of the upper crust (Table 1) into the relation: T=WL / Vs (4) where T is wave period, we have T=22.5 sec, which is close to the predominant period T=23 sec of incident waves Pr (Fig. 2). When we substitute the crustal thickness of H=37.5 km into Eq. (3), we have WL=150(n=0), 50(n=1) km. However, scattered waves of these wavelengths are weak. The wavelengths of scattered waves for Model LB with a double low velocity zone elongate strongly (Yoshida, 2003; Yoshida and Hagiwara, 2006).

References:Snodgrass,F.E.,W.H.Munk,andG.R.Miller,J.Mar.Res.,20,3-30,1962; Momoi, T.,Bull.Earthq.Res.Inst.,Univ.Tokyo,62,163-200,1987;Yoshida,M., Earth Planets Space 53,1099-1109,2001;Yoshida,M.,Bull.Earthq.Res.Inst.,Univ.Tokyo,78,1-18,2003; Yoshida, M. and H.Hagiwara, Japan Geoscience Union Meeting 2006 Abstract.



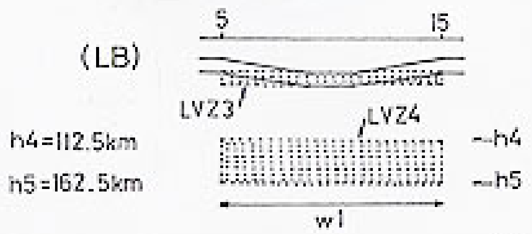


Fig. 1. Crustal and upper mantle structures with (Model LB) and without (Model T) a double low velocity zone (LVZ) beneath the Tien Shan.

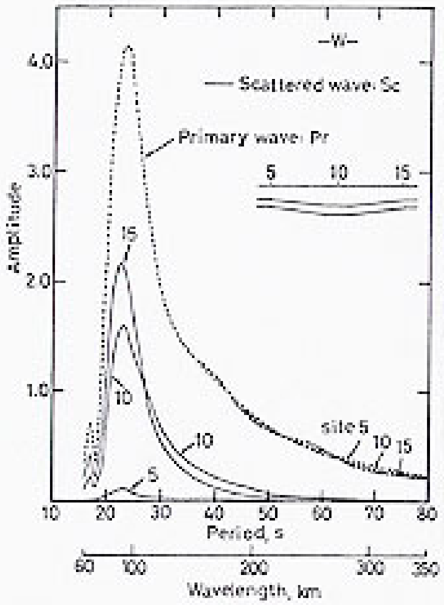


Fig. 2. Amplitude spectra of scattered (Sc) and primary (Pr) waves at sites 5, 10 and 15. Pr corresponds to the incident waves.

	Vp (km/s)	Vs (km/s)	ρ (Mg/m³)
Upper crust	6.5	3.9	2.60
Lower crust	7.0	4.0	2.75
(LVZ)	6.5	3.6	2.60
Mantle	7.9	4.9 (4.6)	3.35
(LVZ)	7.3789	4.3433	3.1012

Table 1. Elastic parameters. The Vs of 4.9 and 4.6 km/s in the upper mantle corresponds to the western and eastern regions of the Tien Shan, respectively.

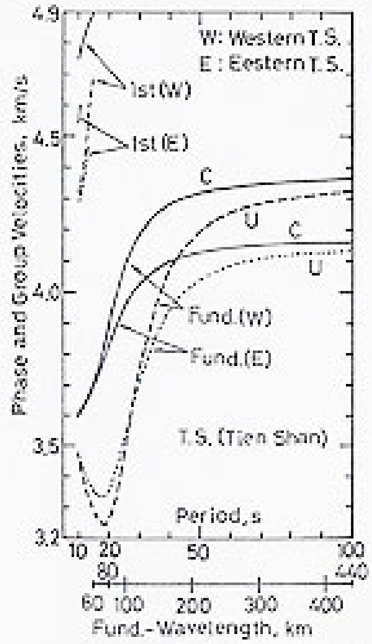


Fig. 3. Phase (C) and group (U) velocities of Rayleigh waves of the fundamental (Fund) and first higher (1st) modes for the western and eastern regions of the Tien Shan.